Enhancing Competence-Based Job Skills Through Moodle: a Paradigm Shift in MOOC Applications

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Abstract. This paper proposes a competence-based job skill model that integrates competencies into MOOCs, utilizing Moodle as a learning management system. The model serves as a framework for aligning course selection with desired job skills and competencies. By combining MOOCs with competencies, individuals can effectively develop their skills in the rapidly evolving job market. Existing research highlights the significance of integrating competencies into courses and job skill development. This paper builds upon this research by presenting a structured approach that starts with courses, progresses to the acquisition of relevant competencies, and ultimately leads to the development of job skills. Many individuals struggle to choose appropriate training courses to enhance their job skills. MOOCs are valuable resources that can guide individuals toward acquiring relevant competencies and job skills. The proposed competence-based job skill model offers a comprehensive understanding of the necessary steps for skill development, empowering students and employees to make informed decisions about their professional growth. To facilitate the model's implementation, a course aligned with the competence-based framework is designed as a practical demonstration. Additionally, the integration of the model with Moodle supports instructors in defining courses based on the model's requirements, ensuring that course descriptions and materials meet the necessary criteria. In conclusion, this paper presents a competence-based job skill model that integrates competencies into MOOCs, leveraging Moodle as a supportive platform. The model provides a structured approach to address the challenge of skill enhancement, empowering individuals to make informed decisions about their professional growth in a rapidly changing job market.

Keywords: Competences, Model, Moodle.

1 Introduction

In today's rapidly evolving job market, the acquisition of relevant job skills is crucial for students and employees aiming to thrive in their careers. Massive Open Online

Courses (MOOCs) have emerged as a promising avenue for providing academic materials and facilitating skill development. However, it is essential to combine MOOCs with a competency-based approach to ensure the acquisition of job-ready skills. This paper aims to bridge this gap by proposing a competence-based job skill model that integrates competencies into MOOC applications, particularly through the utilization of Moodle, a popular learning management system.

The primary objective of this study is to assist students in building their job skills by harnessing the power of MOOCs and leveraging the potential of competencies. By combining these elements, a comprehensive approach is provided that equips learners with the necessary tools for success in their professional endeavors. In this context, MOOCs serve as a powerful tool for individuals looking to enhance their job skills. MOOCs offer a wide range of courses that can be tailored to meet the specific needs of learners. By leveraging MOOCs, students and employees can access high-quality educational resources, acquire targeted competencies, and develop the job skills necessary to succeed in today's competitive job market.

2 Integration of Learning Management Systems (LMS) with MOOCs

New approaches are explored regarding blended teaching, combining LMS and MOOCs. The blended teaching approach aims to combine the benefits of both traditional teaching and online learning to enhance the overall learning experience (Montoya, 2018). In addition, there are studies that focus on integrating learning management systems and massive open online courses to eliminate human error and subjectivity in content selection and sequencing (Rugube, 2022). However, it is of high importance to explore ways to combine job skills and learning outcomes, using these platforms and the components that they offer.

The significance of combining MOOCs with competencies cannot be overstated. A considerable amount of research has been conducted in this area, such as the significance of using MOOC videos and LMS functionalities in order to promote active learning and student engagement. This method can help students focus on learning as much as possible, overcoming challenges through hard work, and increasing their competence at a task (Chandramouli, 2022). In addition, there are studies highlighting the importance of combining MOOCs with a competency-based approach for acquiring job skills. The proposed competence-based job skill model in these studies serves as a guiding framework for students and employees to align their course selection with the desired job skills and competencies (Thanachawengsakul, 2022). Furthermore, in the development of a competence-based job skill model, related work has been explored that focuses on the integration of competencies with courses. Notably, the European Union's competences framework provides valuable insights into the key competences individuals should acquire throughout their lifelong learning journey (Cedefop, 2018). By aligning courses with these competences, learners can gain a broader skill set that encompasses not only technical knowledge but also vital transferable skills.

2.1 The Problem

One of the prevalent challenges faced by students and employees is the uncertainty surrounding the selection of appropriate training courses or program curricula to upgrade their job skills. This predicament arises due to a disparity between the didactic content and acquired competencies offered by teachers and instructors. Often, educators may not sufficiently consider the future job skills required by their students. On the other hand, companies encounter difficulties in finding educational programs or training courses that specifically cater to the desired job skills they seek.

This gap between the educational offerings and the needs of individuals and companies creates a significant problem. It hampers the professional growth and success of individuals who strive to enhance their skill sets, and it poses challenges for companies seeking to hire competent workers. To address this issue, the present study proposes a competence-based job skill model. This model provides individuals with a valuable roadmap to identify courses and programs aligned with the desired competencies and job skills they wish to acquire.

By embracing the competence-based job skill model, individuals can make well-informed decisions regarding their education and training choices. They can focus on acquiring the specific skills demanded by the job market, thereby increasing their prospects for professional success. Similarly, companies can benefit from this model by gaining clarity on educational programs that effectively provide the desired job skills, facilitating the identification and recruitment of skilled workers.

A competence-based job skill model offers a practical solution to address the challenges faced by both students and employers in the realm of job skills development. It seeks to bridge the gap between educational offerings and the needs of individuals and companies. By incorporating this model, individuals can strategically pursue courses that align with their career goals, while companies can more effectively identify and acquire skilled talent.

3 Competence Model

A competence model serves as a framework that outlines the specific requirements and guidelines for courses that aim to integrate competencies. In this chapter, the authors delve into the significance of a competence model and the challenges instructors face when defining and uploading course descriptions and didactic materials in Moodle, a widely used learning management system.

A competence model should focus on bridging the gap between academic and professional environments by identifying and developing specific competences that are relevant to both contexts. This approach recognizes that traditional educational content may not always fully prepare individuals for real-world challenges and requirements.

By integrating a competence model into the educational framework, educators can design didactic content that explicitly targets the development of these competences. Instead of solely focusing on delivering theoretical knowledge, the emphasis is placed on practical skills, critical thinking, problem-solving abilities, and other essential competences needed in professional settings.

To ensure effective implementation, the model takes into account the Technological Pedagogical Content Knowledge (TPACK) framework. TPACK emphasizes the integration of technology, pedagogy, and content knowledge to enhance teaching and learning experiences. In the context of the competence model, the TPACK framework offers valuable guidance on how to design didactic content that aligns with a competence-based approach.

When creating didactic content following a competence model, it is important to consider the following aspects:

1. **Competence identification:** Begin by identifying the specific competences that are relevant to the academic and professional scenarios. This involves determining the skills, knowledge, attitudes, and abilities that individuals need to succeed in their future careers.
2. **Competence-based content design:** Once the competences are identified, design the didactic content in a way that directly targets the development of these competences. This may involve creating learning activities, projects, case studies, simulations, or real-world applications that provide opportunities for learners to practice and apply the desired competences.
3. **Reflection and feedback:** To facilitate continuous improvement and development of competences, it is of high importance to encourage learners to reflect on their learning experiences and provide constructive feedback. This process allows individuals to identify areas for improvement and further develop their competences over time.

However, it is important to acknowledge that fulfilling the requirements of a competence model can be challenging for instructors. The process involves careful planning, curriculum design, and instructional strategies to align the course content with the targeted competencies. Instructors must possess a deep understanding of both the subject matter and the desired competencies to develop a coherent and effective curriculum. Moreover, they need to ensure that the course materials and activities are designed in a way that facilitates the acquisition and assessment of competencies.

Overall, by following a competence model and aligning didactic content accordingly, educational institutions can better prepare students for the demands of the professional world. This approach focuses on developing practical skills and competences, empowering learners to apply their knowledge effectively and succeed in their chosen fields.

3.1 Proposed Model

Education skills should be linked to career requirements, since skills are at the heart of hiring processes, which have become costly, labor-intensive, and time-consuming in today's digital world. Ontology languages and tools are important components of developing a competence-based job skill building model as they help to add semantics to competences and provide a structured way of representing knowledge.

Furthermore, related work has been conducted that highlights the combination of competencies with job skills, specifically leveraging Natural Language Processing

(NLP) tools (Driss, 2021). These tools offer innovative ways to analyze job requirements and identify the specific competencies necessary for various occupations. By integrating NLP tools into the model, personalized guidance on the competencies needed to enhance job skills can be provided to learners.

In order to address the interconnection of both academic and professional scenarios in terms of competences, a model for competence-based job skill building has been developed. This model is an incremental iteration of a previous competence model and allows for the representation of both academic and vocational skills (Paquette., 2007). One of the main objectives of this model is to balance the representation of skills from both worlds equally. The model proposes four different dimensions on which the development of the competence model was based:

1. **Competence areas:** This dimension defines the different areas of competence that are relevant to the model. It includes a set of broad categories that help to identify the different domains of knowledge and skills. For example, some of the competence areas might include "Communication", "Problem Solving", or "Leadership". In this dimension, "Context" uses keywords to classify the concepts expressed in the competences. This framework is important in online environments for educational organization and job advertisement.
2. **Competence descriptors and titles:** This dimension provides a more detailed description of each competence, using descriptors and titles that help to define them more precisely. For example, a competence in the area of "Communication" might be described as "Effective Written Communication", with a title such as "Technical Writing".
3. **Competence levels:** This dimension defines the different levels of proficiency for each competence, ranging from basic to advanced. It helps to identify the level of expertise required for a particular job or task. For example, a competence in the area of "Leadership" might have levels such as "Team Member", "Team Leader", or "Executive Leader".
4. **Knowledge, Skills, and Attitudes:** This dimension defines the different types of knowledge, skills, and attitudes required for each competence. It helps to identify the specific abilities needed to perform a particular job or task. For example, a competence in the area of "Problem Solving" might require knowledge in areas such as mathematics or statistics, skills such as critical thinking or decision-making, and attitudes such as persistence or creativity.

These dimensions provide a valuable framework for developing competences in both academic and professional scenarios by defining what competences are needed and at what level they should be developed.

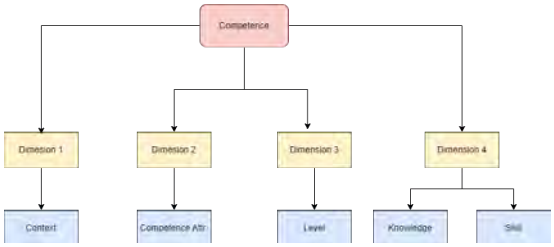

Fig. 1. Dimensions of competences

In the composition of Dimension 1, Context, was considered to indicate the degree of complexity of the competence. A total of 2 attributes were added: skill-knowledge pair and keywords.

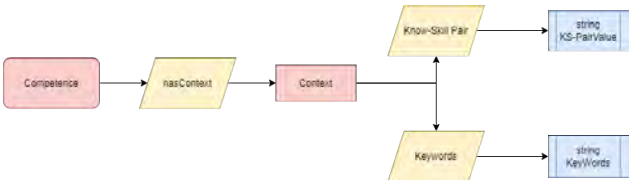

Fig. 2. Context of competences

In Dimension 2, the attributes ID, Title and Description are added, and they are considered the minimum information necessary to complete a competence. The rest of the attributes are details which provide more information about the competence.

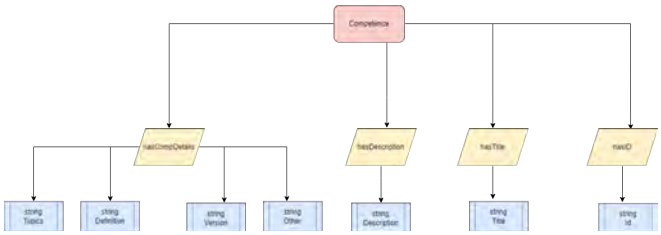

Fig. 3. Attributes of competences

In Dimension 3 the level of the competence is expressed, ranging from basic, intermediate, advanced, and specialized.

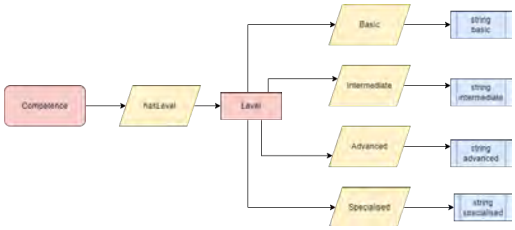

Fig. 4. Level of competences

Finally, for Dimension 4, skills and knowledge are considered. In the case of skills, the SFIA model was used, which provided a collection of attributes and competences by analyzing the different levels of a course and the description at each level. These attributes represent the skills that can later provide information.

In the case of knowledge, the Technological Pedagogical Content Knowledge model is considered. This model consists of three blocks, technology, pedagogy, and content for knowledge. These blocks will also represent the attributes that can be chosen for classification to begin with, along with a fourth attribute which will be the combination of the previous three.

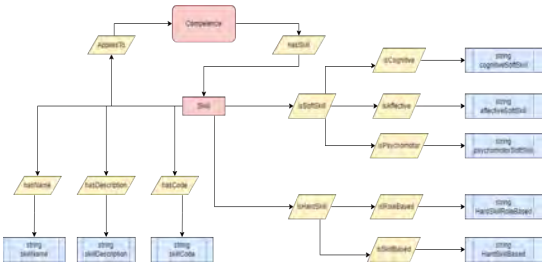

Fig. 5. Skills of competences

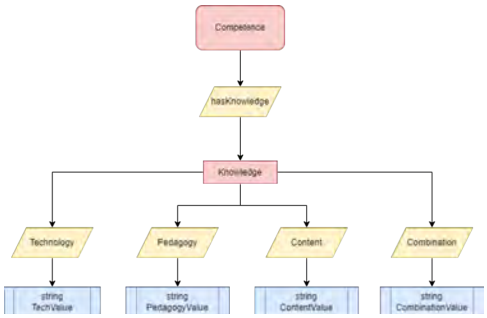

Fig. 6. Skills of competences

3.2 A Paradigm of a Course

To implement this model effectively, a course has been designed that aligns with the competence-based framework. This paradigmatic score serves as a practical demonstration of how competencies can be seamlessly integrated into MOOCs. Additionally, a way to combine this model with Moodle has been developed in order to assist instructors in defining courses based on the requirements outlined in the model. This platform

supports instructors in navigating the complexities associated with following the competence-based approach, ensuring that the course description and didactic material fulfill the necessary criteria.

To analyze the description of a course and extract the competences, along with knowledge and skills, let us consider the course of Information Security. According to the description of the course and by using the SFIA model (SFIA, n.d.), the course is separated in the levels below:

Information Security – Level 1

- Learn about the operating system concepts and other forms of systems software. (losc, lss)
- Learn about standard operating systems functional components such as memory, process/thread, file system. (lsosfc)
- Learn about Cyber security and network principles as applied in cyber and physical environments. (lcs, lnp)
- Learn about underlying theories relevant to computer networks and cyber security management. (lut)
- Understand key terms and concepts in Cryptography, Governance, and Compliance, classified and unclassified data, that require encryption. (uc, ug, ucomp, udata)

Information Security – Level 2

- Define confidentiality, availability and integrity (CIA) in the context of Information Assurance. (dc, da, di)
- Describe the hardware, software, and services that comprise an enterprise network, and be able to articulate how these components integrate to form a network solution. (dh, ds, derv, acns)
- Define principles and techniques of network and cyber security risk management. (dp, dt)
- Define key networking protocols, and hierarchical relationships in the context of a conceptual model, such as the OSI and TCP/IP framework. (dkno, dhr)
- Define methodologies for implementing security, security policies, best current practices, testing security, and incident response. (dmis, dmisp, dmip, dmit, dmii)

Information Security – Level 3

- Plan, apply, and audit operating systems' security in a networked, multiplatform, and cross platform environment. (poss, aoss, auoss)
- Analyze architecture, detect vulnerability, and recommend physical, logical, or administrative controls to mitigate the threat. (aarch, dv, rplac)
- Design and implement risk analysis, security policies, and damage assessment. (dir, dis, did)
- Design and implement solutions to practical network and cyber security problems. (disol)
- Design and implement security solutions. (diss)

Information Security – Level 4

- Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an organization. (ekn, ppd, scn)
- Evaluate and analyze networks, security policies, security controls and threats using a range of techniques. (ean, easp, easc, east)
- Identify risks that arise from potential technical solution architectures. (ir)
- Design alternate solutions or countermeasures and ensure they mitigate identified risks. (das, dc, emir)
- Investigate suspected attacks and support security incident management. (isa, ssim)

Information Security – Level 5

- Provide advice and guidance on security strategies to manage identified risks and ensure adoption and adherence to standards. (pag, mir, eaa)
- Contribute to development of information security policy, standards and guidelines. (cdisp, cds, cdg)
- Obtain and act on vulnerability information and conduct security risk assessments, business impact analysis and accreditation on complex information systems. (oavi, csra, cbia, cacis)
- Investigate major breaches of security, and recommend appropriate control improvements. (ibs, rci)
- Develop new architectures that mitigate the risks posed by new technologies and business practices. (da)

In these sentences, the verb defines the skill and the noun the knowledge. Storing the concept of competence and associating it with Knowledge-Skill pairs is important for effective competence management.

The next step is the separation of these competences according to whether they are Receive, which refers to learning a skill, Reproduce, which is based on applying the skill in examples and exercises, and Produce/Create, which considers applying the skill to generate work results. Another final attribute could be Self-management, which is based on influencing with the acquired skill.

Table 1. Competences.

Receive	Reproduce	Produce/create	Self-management
Learn (losc, loss)	Define (dc, da, di)	Plan, apply, audit (poss, aoss, auoss)	Exhibit, protect, secure (ekn, ppd, scn)
Learn(lsosfc)	Describe, articulate (dh, ds, derv, acns)	Analyze, detect, recommend (aarch, dv, rplac)	Evaluate, analyze (ean, easp, easc, east)
Learn (lcs, lnp)	Define (dp, dt)	Design, implement (dir, dis, did)	Identify (ir)
Learn (lut)	Define (dkno, dhr)	Design, implement (disol)	Design, ensure (das, dc, emir)

Understand (uc, ug, ucomp, udata)	Define (dmis, dmisp, dmip, dmit, dmii)	Investigate, support (isa, ssim) Investigate, support (isa, ssim) Provide, ensure (pag, eaa) Contribute (cdisp, cds, cdg) Obtain, act, conduct (oavi, csra, cbia, cacis) Investigate, recommend (imbs, raci) Develop (dna)

After this, each competence can be classified according to the dimensions and the designing mentioned above, to extract information and design the tree. The decision tree based on which the classification of the competences can take place, is the following:

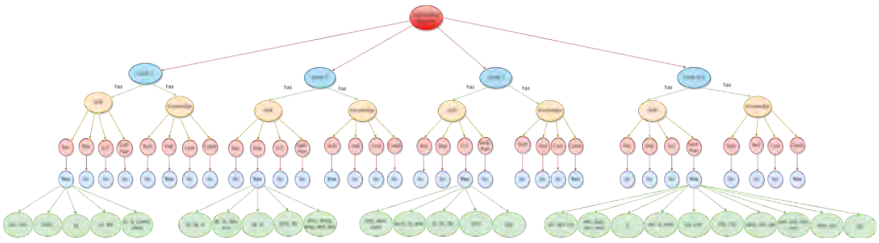

Fig. 7. Decision Tree

4 Adapting Competence Model to Moodle

To seamlessly integrate the competence model described above into Moodle, a series of steps are undertaken, ensuring a streamlined process for instructors and learners. The following steps outline the adaptation process:

1. **Logging in to Moodle:** The initial step involves accessing the Moodle platform by logging in with appropriate credentials. This grants users access to the functionalities and features available within Moodle.
2. **Course Creation for Professors**: Users with course creation permissions have the privilege to create new courses within Moodle. This step allows professors to set up the necessary learning environment tailored to their specific teaching requirements and objectives.
3. **Redirection to the Questionnaire:** Upon course creation or accessing an existing course, the user is automatically redirected to a specially designed questionnaire. This questionnaire is a fundamental element of the adaptation process, acting as a means to gather relevant information for competency assessment.
4. **Answering Competence-based Questions:** Within the questionnaire, participants are presented with a series of questions that are carefully crafted based on the competence methodology. These questions aim to evaluate and assess the competency levels of learners in a comprehensive and structured manner.
5. **Creation of a Webpage from the Database:** After users have completed the competency-based questionnaire, the system automatically generates a dedicated webpage for the corresponding course based on the questionnaire responses. This webpage serves as a centralized hub of information and resources tailored to the specific competencies identified through the questionnaire.
6. **Linking the Webpage to Moodle:** The final step in the adaptation process involves integrating the generated webpage seamlessly into the Moodle platform. This linkage ensures that learners and instructors can easily access the competency information and incorporate it into their teaching and learning activities within the Moodle environment.

By following these steps, the competence model is effectively adapted to the Moodle platform, creating a robust and user-friendly framework for competency assessment and personalized learning experiences. This integration enables instructors to leverage the competency data and tailor their instructional strategies accordingly, fostering a more targeted and effective learning environment for learners.

5 Conclusions & Discussion

In this paper, the authors have proposed a competence-based job skill model that integrates competencies into MOOCs using Moodle as a learning management system. Our primary objective was to empower learners to make informed decisions about their professional growth in the rapidly changing job market. By aligning course selection with desired competencies, individuals can focus on acquiring job-ready skills, enhancing their employability.

The model's key strength lies in the vision of automatic course content creation based on learners' questionnaire responses. This approach streamlines the course creation pro-

cess, ensuring that course materials are tailored to specific competencies. The integration of Natural Language Processing (NLP) tools further enhances the model's effectiveness, providing personalized guidance on relevant competencies for each learner.

By combining MOOCs with the competence-based approach, we bridge the gap between educational offerings and industry demands. Learners gain access to high quality resources, targeted competencies, and practical skill development, while employers benefit from a more efficient recruitment process. While there are some limitations, continuous research and improvements can further refine the model's accuracy and relevance.

In conclusion, our competence-based job skill model offers a structured pathway for learners seeking to thrive in the dynamic job market. The integration of competencies into MOOCs, powered by Moodle and NLP, provides learners with a personalized and effective learning experience. As we move forward, this model holds the potential to revolutionize skill development and empower individuals to succeed in their professional pursuits.

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